Sustainable Redevelopment of 444 Hebron Rd.
Heath, Ohio

Denison University Environmental Practicum
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I. INTRODUCTION

Anyone who drives on Ohio Route 79 on their way to or from Heath, Ohio, will observe Meritor's massive factory on the side of the road if they choose to look. For decades, this factory was a lynchpin in the economy of the region, giving many people a stable income and good skills training. Unfortunately, over the years, it has lost its former glory, and it now stands abandoned and is in the process of being torn down.

This site stands at a crossroads. Across the street, the Newark Earthworks have applied for a World Heritage Site designation, which could bring plenty of activity to the immediate surroundings. This means that it is a good time to redevelop this site to help stimulate more economic activity in the area.

However, there are several environmental concerns with the site. A landfill and oil plume loom at the back, and the concrete slab in the front could have any number of contaminants underneath it. This contamination is compounded by the urgent need to address climate change, which means that any redevelopment proposal on this site should be focused on sustainability and have a low energy and carbon footprint.

All of these factors have made redevelopment of 444 Hebron Road a challenge; however, our class has collectively come up with two proposals that we believe would benefit Heath and Newark economically, while providing environmental and community benefits. Our first proposal reflects the development of the Newark Earthworks, and intends to remake the property as a destination site for tourists at the Earthworks. Our other proposal reimagines the site as a solar manufacturing plant, which will bring jobs back for a good cause. Both projects would have the component of solar panels on the back of the site, thus providing the property, and ideally the surrounding area, with cheap renewable energy.

II. DESTINATION DEVELOPMENT

Overview

The intent of this business development plan is to pursue land use for the redevelopment of the 78.27 acre (3,409,441.2 square feet) industrial site in the City of Heath at 444 Hebron Road, currently owned and operated by Meritor, Inc. Constructing a multi-use space with primarily an Earthworks museum (261,360 sq. ft.) containing a souvenir shop (which takes up 43,560 sq. ft. of the 261,360 sq. ft.), six restaurants (79, 860 sq. ft. each), ample car parking (217,800 sq. ft.), and green spaces (approx. 130,680 sq. ft.) around the perimeter of the pre-existing industrial warehouse will provide local residents, state residents, and people worldwide with the opportunity to engage in the cultural history of Native Americans in a fun yet educational way. This plan will ensure that visitors of the anticipated World Heritage site of the Newark Earthworks across the street will induce the amount of consumer activity within the City of Heath from an economic standpoint. The remaining acreage (approx. 871,200 sq. ft.) can be utilized via solar arrays. Having a plaza with a museum and traditional-based restaurants dedicated to the work of the American Indians will provide people all over with the importance of their contributions in today's developed world.

<u>Components of the Museum</u>

The Earthworks Museum will have interactive collections and modules that visitors can interact with during their visit. Ideally, the museum should be designed as a segment or continuation of the actual Newark Earthworks, motivating visitors to take advantage of going to both places. This could be accomplished by having a linear flow of graphics regarding how the Earthworks were created from a historical and cultural aspect. The purpose of this would be to walk visitors through history. Graphics would be 3-D along the wall and caption information pertaining to the graphics would be foot censored—where individuals visit a particular graphic, the caption and information pops up via an automatic transcription from a projector located on

the ceiling. After the walkthrough, visitors would end in a “mound room” where they have the opportunity to design their own mound. This would be contributed to a “mound wall” that can be placed in a designated area of the museum, based on the buyer’s choice.

Financial Models

Starting a museum is very expensive. Hypothetically speaking, the exhibition space would consume almost half of the overall space. Constructing a new museum facility would cost between $297-$434 per square feet (United States Department of the Interior, n.d.) In our case, with over 200,000 square feet of land used for the museum, the upfront cost of a museum of this size would be $77.6 million. Adding restaurants and possible other activities will offset the price of building purely a museum.

Business Development and Planning

Mission Statement

The Earthworks Plaza seeks to deepen the understanding of past choices, present circumstances, and future possibilities of the livelihood of Native Americans; strengthen the bonds of the community; and to further education of our cultural history.

The Market

Within the United States, there are less than ten Native American museums, and there are even fewer that have a Native museum with traditional restaurants; no plazas in present day focus on the history of Native Americans via a museum and traditional Native American restaurants in one central place. Purchasing this property and utilizing this specific development plan will set history within the United States of America, and the City of Newark would have much pride in knowing that they are impacting a plethora of individuals.

Our Competitive Advantage

The City of Newark’s Vision Statement is to “enhance the quality of life for those who live and work in our community by providing vision, leadership, and performance standards that promote health, welfare, and environmental stewardship” (City of Newark, 2019). Similarly, the City of Newark’s mission statement is to “provide its residents, businesses, and organizations with professional, unbiased, personalized, and effective public services to help build a strong community based on our welcoming atmosphere, cultural heritage, and diversity with Mid-Western livability” (City of Newark, 2019). Considering the goals and expectations of the City of Newark, the suggestion of this development plan would continue to satisfy the social political climate that this city strives to have within its community, compared to other development plans. The City of Newark is known for the attraction of the Newark Earthworks, which consists of a series of mounds built by the Hopewell Indians. Therefore, it’ll be a great idea to have a multi-use space across the street from the Earthworks site to expand this cultural significance.

Obstacles to Success

While this development plan would serve the mission of Newark, the physical implementation of the museum and restaurants on the site is worrisome due to the implications of the slab. It is unknown if the slab of the pre-existing manufacturing warehouse will be

demolished or not. We propose that keeping the slab intact will be more beneficial for the development of the site. The reasoning is as follows:

1. It requires less investment for a slab to dry. Less personal time implies that development can move along immediately; there is no compelling reason to hold up the few days it takes for the concrete to fix and dry, when under construction/ building over it.
2. The slab would minimize the risk of damage from flooding or the leaking of gases (vapor intrusion).
3. Leaving the slab intact would save money.

However, a con of having the slab intact would be the possibility of slab cracks and needed repair, as well as potential attraction to insects, all of which could add to costs. We believe getting rid of the slab all together under the redevelopment of this site would not have too many implications.

<u>SWOT Analysis for the Development</u>

Strengths:

- Includes more local participation and activity of residents—gives residents more things to do in the community
- Illustrates the outstanding value of world heritage, the exhibition of cultural remains of American Indians that is important for the next generation
- Gift shop/souvenir shop
- Accessible food options within walkable distance
- Accessible Parking

Weaknesses:

- Limited public transportation to get to the Museum, being in a rural area
- Lack of hotels on this specific exit; however, there are plenty within a 2 mile exit

Opportunities:

- To be a progressive tourist attraction
- To directly engage communities and audiences with real, authentic experiences of Native American ancestry
- Collaboration – with schools, libraries, businesses, and each other

Threats:

- Contaminated environment
- Lack of funding and support, especially from state and/or local government
- Uncertainty if the slab will be intact or not under redevelopment of the site

Prospective Buyers

The most probable buyer of the factory would be a land/real estate developer. The average cost of developing a shopping center is $442.00/sq. ft. (Fixr, n.d.). One developer we had in mind was "Developers Diversified Realty." This is a development company from Ohio, and felt that hiring locally would help provide jobs, as well as help gain support from locals. Their company portfolio says they have 100 million sq. ft. of land that they have developed and own, showing that they have experience (NREI, 2004).

Marketing Strategies

Our goal is to make the subject of history fun for young adults. In an economic analysis conducted at Ohio University based on the visitor rate of individuals at Earthwork sites, adults from 18-25 had one of the smallest percentages (Jolley et al., 2018). As a nation that is highly populated by people within this age group, we need to cater to them. In Ohio alone, over 1.1 million people are within this age group, which is higher than most other age groups (Ohio Population Estimate, 2018). In the City of Newark alone, there are a little over 6,800 people between ages 18-25 (World Population Review, 2019) that would definitely benefit from community engagement.

A huge advantage of having the opportunity to buy this site is its central location. With a small population of just over 50,000 residents, networking within the cities of Newark and Heath would be relatively easy compared to higher populated locations. Residents within the community would be able to not only voice their opinions in the Newark Advocate, but face-to-face networking would benefit the people of Newark and Heath. Having an Earthworks museum would be beneficial to potential educational opportunities for both high schoolers and college students. Partnering with local universities such as Denison and local high schools (or the Ohio Department of Education) would be advantageous for more visitor activity. Ultimately, we'd like to make the museum a way for more students and visitors to make their way over to the Newark Earthworks, instead of relying on the Newark Earthworks to be a direct source to the prospective Earthworks Museum on 444 Hebron Road.

Community Relations/Press

Something that will contribute to this site's success will be having good relations with the community—both the local community of Licking County and Central Ohio and beyond. Some actions that will help with our goal of attracting visitors are news announcements, social media, and advertising.

We plan to announce the opening of the site on all local Ohio news networks. We feel like advertising to the major cities in Ohio is not enough, and feel that if we make this announcement on most Ohio networks, it will have a better chance of being seen by people who live in rural areas and not just cities. This is important to our plan, as there are many rural communities in Ohio, and many of those people have the potential to visit the site.

One way we hope to involve the community would be advertising to local high schools and colleges. We realize that there are many high schools and colleges/universities in the area and hope to gain access to that market of potential visitors, some of whom might be overnight/ multi day visitors. Advertising at OSU in Columbus, its branches, Otterbein, Oberlin, Kenyon,

Denison, and many of the other schools in this area, as well as other schools throughout the Midwest, will help gain repeat visitors. Local high schools and universities can also add the site and museum to their curricula and syllabi, which would help draw visitors.

We also feel that students will be more apt to come if they are incentivized, as well as making it easier for them to gain access. To encourage students to come, we feel like offering student discounts on tickets, and other nearby attractions would help. We also feel that offering group discount rates for large groups would encourage students to bring friends. Another way we hope to get students to come would be having a Paypal/Venmo/Cash App. Having these services would help make payments easier for people to pay for tickets to the museum as well as the site, which might help people who are on the fence about coming.

While the title of "Unesco World Heritage Site" might be convincing enough for many visitors to come, we also realize that this would be a niche market and feel that many of them would come once, rather than repeat business there. One way we hope to advertise to people would be through the use of social media and memes. People often get news and learn about things through shared articles on social media and memes. While using memes and social media would help, we also feel that a celebrity shout-out would help encourage young adult and teen visitors.

While having day-trippers and students frequent the site would provide a boost to the local economy, we also hope to encourage overnight and multi-day visitors. One way we plan on doing this would be having ticket deals for visitors. For example, we feel if we were to sell tickets at local hotels, it would encourage people to buy tickets, as it would be easier and more accessible for them. We also think that selling multi-day passes would help encourage people to come; as they could buy a multi-day pass and would be able to visit any time before their pass expires. This would encourage people to stay in the area and visit the site, as well as the local surrounding area more than they originally planned. Having multi-day, and possibly monthly or yearly passes, would encourage people to come back multiple times.

This site has a capacity of 9.66 MW and can produce 24,150 MW/h annually. This is based on 48.3 acres of solar coverage, with 21.3 acres over the brownfield, 17 over the roof, and 10 through solar canopy parking. The solar array imagery in the Northeast portion of the site demonstrates the 21.3 brownfield coverage. 17 rooftop acres of solar plus another 9.98 acres from the canopy or ground mounted array would power the entire main building.

III. INDUSTRIAL DEVELOPMENT

Overview

We are proposing a solar manufacturing plant to be built where the pre-existing Meritor slab is located on the 444 Hebron Road property in Heath, Ohio. This solar manufacturing plant is to be self-generated by the solar panels created on site, as those panels can be placed on ~90% of the 750,000 square feet of roof over this immense structure. We believe that this plant is

exactly what Heath and the surrounding community needs, as it will bring creativity and innovation along with more reliable jobs to the local population.

Financial Models

There are several components to consider in a financial model when implementing a solar manufacturing plant. The most important aspects to consider are listed below:

- Price of land ~ $5,250,000
- Property taxes ~full year $85,865.66 (lLicking County, 2018)
- Income tax
- Utility costs
- Equipment costs
    - Sales tax for equipment
- Other various costs needed for a solar manufacturing plant

Unfortunately, many of these aspects, which are necessary to be calculated into the financial model, were untrackable for the dollar amount for such a specific site. However, Nate Strum, the Director of Grow Licking County, has in-depth experience with financial models and brownfield calculations. Strum verified that he recently worked on a small to medium facility of approximately 35,000 sq.ft. For this project, Nate budgeted around 8 million dollars or $220 per sq. ft. With this predetermined ratio, We applied the $220 amount with the Meritor slab of 750,000 sq. ft. This calculation estimated that approximately $165,000,000 will be needed from an incoming buyer.

<u>Potential Financial Benefits</u>

- The first potential benefit to consider is that the estimated budget amount of $165,000,000 did not account for the implementation of solar panels to power the plant itself. Incorporating solar panels on the property would decrease utility costs and could generate extra revenue.
- Ohio Statewide Development Corporation (OSDC) has the opportunity to provide loans to support long term investment in building sites. The OSDC even provides loan support for equipment and etc. to help the site get things in motion.
- The Meritor Property could be purchased by a foreign company and receive a foreign direct investment (FDI). This investment could help mature solar manufacturing in the United States with the ideal location of Central Ohio.

Business Development and Planning

<u>Goals</u>

- Demonstrate sustainable development on a brownfield site
- Create ~375 new jobs in the Licking County community
- Clear Meritor of liability for the property
- Develop the solar market in Ohio with increased manufacturing competition
- 100% powered by solar energy manufactured on-site

<u>Mission Statement</u>

Our mission is to develop the solar manufacturing market further through the production of efficient, sustainable, and affordable solar energy. By valuing integrity, communication, reliability, and innovation, our role will go beyond that of a typical manufacturer to ensure the best possible outcomes for our employees and clients. Furthermore, by being completely powered by solar energy that we create on a brownfield site, our business should act as a great example for healthy and innovative land redevelopment.

Business Strategies

To accomplish each of our business goals, every individual working at the plant must have a full understanding of the site's history. This universal understanding will enable our business to thrive because any worker will be able to recognize that the work they are doing is important for the future generations; generations that will otherwise be wrapped up in more brownfields, environmental destruction, and everything between. With regard to our first goal of demonstrating sustainable development on a brownfield site, our plant's ability to self-generate solar power is a clear indicator of the site's turnaround into a healthier condition. Staying true to self-generation of energy will not only be fundamental for the goal of sustainable development of the plant, but also an impressive measure for the surrounding community. Through the connection of solar manufacturing and solar generation, our plant will be a worldwide example of how to put solar power to use at the industrial level.

The creation of about 375 new jobs in Heath would be a significant advantage to the local economy and community. We calculated this number based on First Solar's new solar manufacturing plant's expected employment numbers just outside of Perrysburg, Ohio (Elms, 2018). In order to ensure that jobs will be accessible to Heath and its surrounding areas, we propose to create a new occupational track at Central Ohio Technical College (COTC) for solar manufacturing. This college already offers a solar manufacturing workshop that is for students planning to take the Electronics Technicians Association Level 1 photovoltaics (PV) certification exam. These students have the opportunity to go into solar PV array installation, but our goal is to build on this program to create a solar manufacturing track as well (COTC, 2015). This way, our business's demand will be fed by the students coming out of COTC's solar manufacturing track, since they will hold a certificate or associate's degree in the manufacturing process of solar arrays functioning as renewable energy. This new track could be modeled after Lorain County Community College's manufacturing engineering academic program, which offers short-term certificates, one-year certificates, associate degrees and even a university partnership program with the University of Akron in manufacturing engineering technology (Lorain County Community College, n.d.). While this track is broad, giving a focus on solar energy manufacturing would allow for COTC to serve as a pipeline school to our proposed business.

Clearing Meritor of their liability of the site would be a simple task if the potential buyer of the site would be 100% compliant in taking liability for the land. We do realize that the probability of this happening is minimal, however, since the site is a brownfield. Our ideal plan would be to give the land liability to the City of Heath, and then let the city address further issues that may come forth in the following years after the creation of our solar power plant. If that does not go through with the city, then we would like to let Meritor collaborate with our new solar business to go over everything they would be legally responsible for. If neither the new business nor the City of Heath are willing or able to take liability, we would turn this issue over to the state.

Developing the solar manufacturing market in Ohio would be possible through our new plant because of increased competition. This could potentially lower prices since we want to make solar energy more affordable, as other companies would then attempt to follow suit. Ohio already has 110 solar manufacturers and prices in the state have fallen 32% in the last 5 years, so our new site would only add to these numbers positively (Ohio Solar, 2019). An important thing to note is that not all these manufacturers produce actual panels, but subproducts of them, and our business would be among the largest like First Solar in Perrysburg, Ohio. Furthermore, Nate Strum from Grow Licking County included that industries in Central Ohio are in a great location because we are within a 10-hour truck delivery radius to large metropolitan areas like New York, Washington, Atlanta, St. Louis, Chicago, and Toronto (Strum, 2019).

Obstacles to Success

We recognize that the issue over who is to take liability for the environmental damages on site is a really significant burden to overcome. Another obstacle is the creation of a timeline for our project. Because the site's 750,000 square foot slab's removal is still up for debate, we have the chance to be delayed by that demolition by many months. This goes on top of the current delay from the demolition of the existing building, so we estimate that our project is at least a year and a half out from starting. Once we do get everything lined up, the construction timeline and job fulfillment depends on many factors, such as how long it takes COTC to set up their new solar manufacturing track, or how long it takes to get the liability off of Meritor's hands. A third obstacle we foresee is the ability to find a prospective buyer of the site that wants to move forward with our project idea, as this new business may not want to be solar powered itself, or may not want to create as many jobs as possible.

Prospective Buyers

Over the last decade, the solar market has grown at a rate of 50% annually, generating a $17 billion investment in the American economy in 2018 (SEIA, n.d.). The industry has continued to expand as the cost of solar installation has dropped by 70% in the last decade, making solar a more affordable option for businesses and homeowners (SEIA, n.d.).

This is one of the more difficult aspects of this project, given that companies are not advertising the growth of their company or if they are looking to expand in the United States. It was recommended that we review companies that are not based in the United States since solar is growing rapidly in other areas of the world and these companies are looking to expand their markets into North America. Our group still sees a company like First Solar being a potential client, given that they are local and growing. In order to get a better understanding of the solar industry outside of Ohio, there are three companies that stood out in our buyer research: Heliene, Mission Solar, and Sun Spark. Heliene is a European based company, but has expanded into North America with the intention of continuing to expand their business outside of Europe. The company produces 5-6 different types of panels, with most of their manufacturing currently taking place in Canada and other northern states in America.

Mission Solar is based out of San Antonio, Texas and advertises the significant, positive economic impact that their plant's presence has had on the city of San Antonio. All of their manufacturing or assembly is conducted in the United States, but our research was inconclusive about whether or not they are looking to expand. However, given that their company is isolated to a different part of the country and is also experiencing success, Mission Solar appears to be a

potential buyer worth approaching. Sun Spark is the third company that was researched, who is based in China with a manufacturing plant in California. Sun Spark is one of the leading solar manufacturers in the United States, making four different types of panels. Similar to Mission Solar, Sun Spark could serve as a potential buyer because of their isolated presence in one area of the country and that they are also a leader in solar manufacturing that could benefit from a plant in the Midwest.

Marketing Strategies

In order to market our products to the consumer base, we must first present a functioning and attractive website. By giving our business virtual appeal and easy access to communicate with us, we can close the gap for customers that would otherwise be turned off by a poor online presence. We then can use COTC as a base for gaining employees, and could build off of their network if this process falls short. Media awareness of these jobs is almost expected in local newspapers like the Newark Advocate, as this business would be one of the most innovative and significant projects in local history. Awareness can also happen through Grow Licking County's Instagram platform, as the purpose of their page is to promote employment opportunities and news within the county. We would also like to advertise our positive work on a brownfield site to other brownfield sites around in order to give those destroyed lands a sense of purpose again. We can do so through collaborating with the Ohio Environmental Protection Agency, and once again tapping into their network for brownfield project inspiration outside of Ohio.

Community Relations/Press

Involving the community on this project is extremely important. As aforementioned, we would like to join forces with COTC to generate a several-year pipeline for students studying solar manufacturing to get a job at our new business. This promotes people staying in the community, builds onto the economy, and encourages students to study this field as they can have a clear vision of what their employment outcome may look like.

Beyond job accessibility being centered in the surrounding community, the local population must be informed on our project's process. Heath and the metropolitan area around it must know why a solar manufacturing plant is the best decision for what should come of this brownsite. Since we do not want to hide anything from the community, we can remain involved through these methods:

- Town hall or press release to inform the community on the planned project and how it will benefit the community. Also include the info on how to get involved in the project through employment
- Update our site progress, goals, and eventual timeline through the Grow Licking County Instagram platform (Nate Strum)
- Communicate and collaborate with the Chamber of Commerce in Heath to determine the public response to this project, and from there determine next steps in community involvement
- Hold another town hall or press release upon the completion of our project about the community's opportunity to take part in environmental education inside the solar array behind and around the plant

This site has a capacity of 9.66 MW and can produce 24,150 MW/h annually. This is based on 48.3 acres of solar coverage, with 21.3 acres over the brownfield, 21 over the roof, and 6 through solar canopy parking. The solar array imagery in the Northeast portion of the site demonstrates the 21.3 brownfield coverage. The manufacturing plant would consume 2,737.7 MW/h annually, which is 10% of what our site would generate. This shows that 90% of our solar could be sold back to the community.

IV. SOLAR INSTALLATION

Overview

The site at 444 Hebron is a prime example of a brownfield site that is ripe for redevelopment. It is imperative that we think about our development as an opportunity to implement sustainable practices and products. Therefore, we propose that the installation of multiple solar arrays, along with an interactive solar demonstration piece, would be the best way to develop the site, especially in the areas where utilization is limited due to contamination or other factors. This would result in a development that is committed to sustainability through its production and use of renewable energy, which offsets the carbon footprint of the activities that take place on the site, along with the spread of information about photovoltaics via our interactive solar demonstration.

Installation Types

Our proposal involves three main installations of photovoltaic panels on the site. Our largest installation would consist of ground-mounted panels covering approximately 30 (±10) acres or so of the site, depending on the layout of buildings and other structures such as parking lots. These panels would be located on the eastern portion of the site, where most of the contamination is located, and the ability to use the land for other activities is limited.

Another installation of panels on the site would come in the form of photovoltaic canopy structures over parking lots on the site. This installation involves fewer challenges in terms of installation method, as there is no risk of releasing contamination by puncturing any sort of membrane beneath the parking lot. This installation has the added benefit of shading and protecting the cars parked beneath them from sun exposure and weather (Pickerel, 2017).

Our third installation is a rooftop installation that would go on top of any structures that are built on the site. Whether this development is for a solar manufacturing plant or for a mixed-use development, the rooftops will be covered with solar panels. By including rooftop solar panels in our design, we can maximize the amount of solar energy that is captured on site through our use of the available square footage.

Business Development and Planning

From an overall business perspective, there should be three main goals of the solar array. The first is to create carbon-neutral power for whatever property is on the site. Second, the solar array should do no harm to the land (and hopefully benefit it); which would not only provide environmental benefits but also help avoid some future liabilities for the property owners. The last is to help educate local populations on the benefits of solar, which we will primarily accomplish through demonstrations, detailed below in our marketing strategies.

For the manufacturing plant, the solar array should also be pitched as a positive factor in creating new green jobs in Central Ohio. This in turn will help benefit the market for solar in the state, which will help Ohio become a leader in renewable energy and lower its carbon footprint. Having a solar array on site for such a manufacturing plant will help prove to skeptical residents and job seekers that solar energy works and that their job can make a difference.

Obstacles to Success

Some of the challenges of this development idea are centered around the financial requirements for obtaining the large number of panels needed, as well as the logistics of installing and maintaining them on a site with contamination. We assume that the entity which ends up developing and building on the site will cover the cost of materials and installation; however, there could be other routes to acquiring the necessary capital for this aspect of the redevelopment. Lastly, for the destination development there is the logistical concern of powering multiple businesses with the same solar array.

Prospective Buyers

Who is interested in buying and installing the solar array may depend on whether the site was redeveloped as a destination for the Newark Earthworks, or instead developed as a solar manufacturing plant. In the case of the former, a solar installer would not be directly related to any of the businesses at the site. The solar manufacturing plant, on the other hand, might be used by a company that also installs solar panels, which would give the option for the panels to be installed by that company.

A solar installer that has had success in the Ohio area is Third Sun Solar. Founded by Michelle and Geoff Greenfield in 2000, it has risen to be the largest Ohio solar installer (Third Sun Solar, n.d.). For businesses, it offers an evaluation page, which would be useful to see if solar is viable on the site. Third Sun Solar has not installed on any major properties in Heath, but it has installed panels and arrays in neighboring Newark, Hebron, and Granville, where it installed Denison's solar array (Third Sun Solar, n.d.).

Another group that has installed arrays in Ohio is the Public Service Enterprise Group (PSEG). Although they are based in New Jersey, they operate the largest utility-scale solar array in Ohio (12 MW in Wyandot County). While the Heath project would not be a utility-scale array, the acreage of the property (80 acres) is the same. It would be worth considering whether a utility such as PSEG would want to fund another array, considering their solar history in Ohio (PSEG, n.d.).

As previously mentioned in the manufacturing plant section, there is the possibility of contacting a company outside the United States to build a manufacturing plant. The advantage to this is to have a company with a stronger financial standing and expertise transfer that knowledge to the United States and to help build the market. A potential company to fit this bill is Amarenco, a solar company based primarily in Ireland and France. Amarenco has done business in the United States (although its website does not list specific projects). It also has experience in various types of solar arrays, like roofs of parking lots (or "carports" as it calls them) (Amarenco, 2019). In this scenario, Amarenco could install the solar panels on the manufacturing plant, in addition to owning the plant. Alternatively, a separate, more local company could install the panels. It may be easier for a local company (e.g. Third Sun) to build the solar panels, even if a foreign solar company such as Amarenco owns the site.

A last consideration for this array is that the local utility would probably still operate and own the panels. For much of Ohio this is done by AEP, which operates both the Denison solar array built by Third Sun and the Wyandot utility-scale array contracted by PSEG. AEP has on its website a page on the application process for installing independent power, which is not complicated (AEP Ohio, 2019). Given that AEP has done projects such as this nearby, it seems likely they would be willing to operate the panels.

Marketing Strategies

The idea for the interactive solar demonstration stems from the necessity to get the community, especially students and the younger generation, thinking about green energy and how we can implement sustainable technologies into our lives. This installation would feature a number of solar panels outside that can be manipulated in various ways to affect the efficiencies and energy production of the panels. We imagine that users would be able to tilt the panels, adjust the amount of light hitting the panels, and compare the efficiencies of different panels through time. These manipulations by the users will be visualized through the use of lights that get brighter or dimmer based on how much energy the panels are producing. By having a physical demonstration piece instead of just an infographic or a sign, people can utilize their own curiosities about solar power to help themselves or others learn how photovoltaic panels work. There would also be signs and infographics to complement the interactive display and provide more scientific context for those who are more interested in understanding the nuances of the photovoltaic process, but the main idea for this demonstration piece is to let the users play with it on their own terms in an effort to stimulate learning through their personal experience.

Community Relations/Press

Community relations for the development of this site will be modelled after the efforts of Grow Licking County by creating social media pages to connect the public with the development process in a positive way. Writing a press release and providing a space for public comment will also help gauge community views on the development ideas and engage individuals in the process by listening to their feedback. Those overseeing community relations should work with local officials and organizations, like the Licking County Chamber of Commerce, to get an idea of how this development may impact the community, as well as what the local economy specifically needs out of a new, large development.

For solar specifically, providing education and facts on how a solar installation would positively impact Heath will be included in both the press release and social media posts. Providing the public with data and information on the positive effects of solar, both economically and environmentally, will help ease any apprehension the community might have. The interactive element of our solar installation will also help educate and excite locals and visitors about solar in their hometown, and it is another attraction that can be used to positively advertise the addition of solar to the development and draw visitors to the site.

V. REMEDIATION OPTIONS

Destination

We are aware that the current site on 444 Hebron Road has some contaminated areas, including two landfill areas and an oil plume. We plan to let the land restore itself naturally, being that these areas do not cover a significant portion of the site. Moreover, an advantage of this particular site is that it is also located within the backyard of a residential community. If we can gain the trust and spark the interest of the families living across from 444 Hebron Road, there would be a guaranteed increase of local consumer activity within this redeveloped site.

Industrial

Vapor Intrusions From the Slab

Many factors of the vapor intrusion are reliant on the kind of chemicals being released as well as the amount. This will determine what the proper remedy should be, as well as the cost of that remedy.

(a) For vapor intrusion, potential adverse effects to humans should be evaluated in terms of acceptable exposure based on U.S. EPA risk assessment methodologies, rather than by comparison to the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) values. An exception is made for operating facilities, provided that the contaminant of concern is used in site processes within the area of the building being investigated. OSHA generally will take the lead role in addressing occupational exposures.

(b) Two primary means for mitigating vapor intrusion (both can be used if the slab is left in place or if it is removed):

(i) Application of a barrier beneath a slab/foundation that will prevent the migration of vapors into a building placed over the location of the existing building or in another location at the site where there are known or potential vapor intrusion issues. “Liquid Foot,” a product by Minerals Technologies Inc. is an example of a spray-on product that could be utilized.

(ii) Application of a permeable layer beneath the new slab/foundation and having a sub-slab depressurization system that pulls a vacuum on the zone beneath the slab. Ports can be installed throughout the structure that can be tested to confirm that a vacuum is present. As long as a vacuum is present beneath the new slab, you can be certain that the potential for vapor intrusion has been blocked in all locations. (Jim Peoples)

(c) The appropriate means for mitigating vapor intrusions depend on various factors, such as the nature of the Volatile Organic Compounds (VOCs), the size of the project, and whether the means for mitigating the vapor are installed concurrent with new construction or existing facilities are retro-fitted. The design of ventilation systems to mitigate indoor air concentrations (HVAC) will also have to be considered when dealing with vapor intrusions.

(d) For any remedy chosen for a site, long-term monitoring of soil, gas, and indoor air may be necessary under an Operations and Maintenance (O&M) plan. The frequency of monitoring will depend upon site-specific conditions and the degree of VOC contamination.

Paying for Remediation Costs

The cost of remediation to the standards of the Voluntary Action Plan (more on VAP below) is unknown, but there is a strong probability that it will be high. The seller, buyer, or a governmental agency will be responsible for paying the cost of cleanup. There are many ways this scenario could play out, but an intriguing option is for Meritor and the City of Heath to pay

for the cleanup. Meritor would lose liability while the City of Heath loses an eye-sore and creates potential for economic development.

Solar

In order to mitigate the chances of contamination that is currently sealed underground from being released, precautions must be taken with regard to the installation of the mounting hardware for the ground-mounted panels. In some areas of the site, there is an impermeable membrane located less than two feet (~18 in) under the surface of the soil (Peeples, 2019). When using conventional panel mounting hardware, the panel mounting hardware must be driven more than two feet into the soil; therefore, extra measures must be taken to prevent a breach of the membrane in these areas (Pickerel, 2017). We propose that additional soil would be placed on top of the areas of the site where these membranes are located so that the support structures for the panels can be installed without the risk of puncturing the membrane. Soil assays must be performed by a professional soil scientist to determine if this method would be sufficient to both securely install the panels and also make sure that placing more soil on top of the membranes will not cause damage to them. We could also use a concrete ballast method to mount the panels, which would consist of large concrete blocks resting on top of the soil which would provide a foundation for the panels to be mounted upon. This method has the benefit of eliminating the risk of penetrating through the membrane. However, this approach might be difficult to install, along with being less suited for the areas of the site with topographical heterogeneity (Pickerel, 2017).

VI. LEGAL CONSTRAINTS

VAP Overview

The Ohio Voluntary Action Plan (VAP) provides legal protection to a current or potential property owner from the cleanup and liability of a brownfield site, after it has been decided by an official body that no further remediation is required. The program is entered voluntarily by an owner or interested buyer of the property and must then be certified by an environmental consultant to be viable for VAP cleanup (Koncelick, 2013). After site cleanup and evaluation, the State of Ohio will issue a Covenant Not to Sue (CNS), which is recorded by the County Recorder's Office and will follow the title of the property in the future. This CNS is what we anticipate would protect Meritor from any future responsibility related to the site and would instead fall on the new buyer.

Destination

Since this development will be a multi-use structure that includes restaurants and food service, the property will need to be cleaned past its current industrial standards to at least meet commercial standards, to match the amount of time visitors will likely spend onsite. Either Meritor or the potential buyer should enter into VAP, reducing Meritor's chances for future liability. In addition to VAP, the Brownfields Utilization, Investment, and Local Development Act (BUILD Act) would allow for more funding for cleanup, and it will help to increase a focus on renewable energy or energy efficient projects, making the addition of solar panels to the site more important as it will bring in more funding.

Industrial

Ideally, we would envision Meritor donating the property to the City of Heath as a gift. This would relieve Meritor of future liability, which is their main concern. However, both Meritor and the City of Heath would be involved in financing the costs of the VAP process. Primarily, resources will be allocated towards cleaning the site to reach industrial site standards. Depending on the estimated cost of remediation to this level, we would next advise that the site at least be cleaned to meet recreational use standards, in case the site is no longer used for industry in the future.

Our concern about handing the Meritor property over to the City of Heath is the very expensive cost of remediating the site. There are several funding opportunities through agencies like the EPA that provide funding or loans for the remediation of brownfield sites. For example, the EPA Brownfields Program provides the Assessment, Clean Up, and Multipurpose grants that allow the applicant to request between $200,000 and $800,000 for remediating an approved brownfield site. Meritor should expect to contribute significantly to the remediation of the site if they wish to relieve themselves of liability instead, while the City of Heath will take steps to apply for the various brownfield grants supplied by the EPA.

Solar

There are no legal constraints in VAP specifically regarding solar installation, but there is a point of compliance (Ohio EPA, n.d.) regarding soil safety which could affect solar installation. For industrial and commercial sites, the VAP soil standards must be applicable at a depth of at least two feet. There are also standards for contaminated soil that must be excavated. The EPA defines construction or excavation activities as “invasive activities that result in potential exposure” of workers during the work day or during construction (Ohio EPA, 2014). These activities include installation of utilities and footers, which may encapsulate the installation of solar. These standards may be relevant when installing solar on the landfill portions of our site, and uncontaminated soil may need to be added to this portion of the site to create an adequate barrier between the surface and contamination.

VII. REGULATORY FRAMEWORKS

Destination

Zoning

The Meritor site is currently under the General Manufacturing District, this will need to be changed to a mixed-use in order for its use to be changed to fit the new needs of the property. This will require an application to the office of planning and a period of public notice. All other legal proceedings will be dealt with with with the office of planning**.**

Industrial

Zoning

The Meritor site is currently under the General Manufacturing District and will not require a zoning change with our proposal of a solar manufacturing plant.

Required Conditions and Height

(a) No building or structure shall exceed fifty feet in height.

(b) Newly established manufacturing uses adjacent to or backing a residential district shall provide on that adjacent property line a dense hedge, tree row, or other suitable landscape device adequate to visually screen the industrial area from the residential area.

(c) No direct or reflected glare shall be permitted which is visible from any property or from any public street, road, or highway.

Workers

(a) Ohio is under federal OSHA jurisdiction, which covers most private sector workers within the state. State and local government workers are not covered by federal OSHA.

(b) The largest factor of vapor intrusion guidance will be the length of time that the space is occupied. For an industrial scenario, it is usually assumed that an individual spends just one shift per day in the space; this assumption is what is used to determine the duration of exposure that is allowed. In comparison, housing scenarios assume that an individual spends 24 hours a day, 7 days a week, in the space; therefore, lower screening levels are required (Jim Peeples).

Solar

Zoning

The City of Heath does not have any specific zoning laws or regulations that pertain to solar installation and use. For the destination-oriented development, solar panels would most likely fall under Accessory Uses (1173.03) in the chapter on General Business Zoning in Heath's Code of Ordinances (American Legal Publishing Corporation, 2018). The Accessory uses for a manufacturing plant can be found in the code for General Manufacturing Districts (Chapter 1177). There are no regulations within these two sections that explicitly prohibit solar installation.

Since there are no specific regulations and prohibitions for solar installation and use in Heath's zoning codes, the only requirement for installation is for the developer to acquire approval of a permit from the Board of Building and Zoning Appeals (City of Heath, n.d.). The Department of Building and Zoning for the City of Heath also recommends that developers meet with City Officials to review development plans.

VIII.FUNDING OPPORTUNITIES

Destination

The History Fund, which is a grant funded by Ohio taxpayers that goes towards history projects within the state of Ohio, would be a great opportunity in supplying exhibit content/material for the museum. We could use this grant to specifically appeal to public programs and exhibits that would uphold a significant portion of the museum space. This would allow for hands-on modules (i.e. The historical context of building an Earthwork mound) that visitors can interact with alongside learning more about the historical and cultural substance of the Earthworks.

Industrial

There are several funding opportunities for a company to receive depending on the goals of the buyer. These various grants, tax credits, and loans are listed below. However, no matter who purchases the Meritor property, the site is listed in Licking County as an enterprise zone. This zoning marker provides the buyer with a 10 year tax abatement of 75%. This opportunity allows any solar manufacturer the opportunity to rebuild the site without the concern of property tax for 10 years.

Job Grants and Tax Credit

- JobsOhio Economic Development Grant
- JobsOhio Workforce Grant
- Job Creation Tax Credit

State and Federal Loans and Grants

I. 166 Direct Loan

II. Innovation Ohio Loan Fund depending on the expectations on the facility

Solar

Federal Grants:

- The EPA offers several brownfield-specific grants, which fund, among other things, assessments, loans, cleanup, planning, development and training, and technical assistance (EPA, n.d.).
- EPA Multipurpose Grant: As mentioned above, this gives up to $800,000 toward cleanup, assessment and the revitalization plan for a brownfield (EPA, n.d.).
- Energy Efficiency and Conservation Block Grant Program: Gives money to various entities with the goal of improving renewable energy on sites (energy.gov). More specific to solar projects; either Meritor or the City of Heath could probably apply for this grant.
- While these could be helpful, the details of the VAP potentially complicate the use of US EPA or DOE grants.

State Grants: Ohio's EPA offers the Targeted Brownfield Assessment Program, which funds and services Phase I site assessments and geophysical surveys (Ohio EPA, n.d.). Since this grant is given to local government agencies, it would not be helpful if Meritor took responsibility for the site and cleanup. However, if the City of Heath took ownership as suggested by the VAP, they could use this grant.

Net Metering:

- For any energy produced by an independent source, net metering requires electric utilities to charge the independent provider for any excess power that is transferred back onto the grid (puco.ohio.gov).
- The rate of pay is the price the consumer paid for the energy, rather than the cost the company would have paid to produce the power.
- Three main criteria: the independent energy is generated on the premises of the site, it is connected to the main utility generation, and it can replace other incoming energy (puco.ohio.gov). A solar array on the site of this brownfield would accomplish all three: It is on the premises, could be connected to the grid, and would offset other energy if installed. Therefore, net metering would almost certainly apply (and given the potential size of the array, it could produce a lot of excess power).
- Net metering is probably aimed at smaller houses and properties, but there is nothing in the law that precludes the possibility of it applying for a larger site such as this one.
- While this would not pay for the array at first, it would make it cheaper to operate later on, making solar economically beneficial for the City of Heath.

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